

the reader an excellent introduction to this largest and most diverse of California's islands. Even if one never gets an opportunity to visit Santa Cruz Island, this book is a necessity for those interested in the flora of California and the phytogeography of the California Floristic Province.

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*The Cruciferae of Continental North America: Systematics of the Mustard Family from the Arctic to Panama.* By REED C. ROLLINS. 1993. Stanford University Press, Stanford. xvii plus 976 pages. Hardcover, \$125.00, ISBN 0-8047-2064-9.

As the World's preeminent authority on the family Cruciferae (Brassicaceae), Reed C. Rollins has produced his *magnum opus* with the publication of *The Cruciferae of Continental North America*. Culminating over fifty years of research and study, this monumental volume provides a comprehensive taxonomic treatment of the family for North and Central America, exclusive of Greenland, the Caribbean islands, and the other islands east of the continent. Complete coverage is provided for all genera, species, and infraspecific taxa known to occur (at least recently) on the continent. Rollins reports a total of 99 genera, 778 species, and 248 infraspecific taxa and hybrids. There has not been such a broad conspectus of the family since that of Torrey and Gray in 1838.

The requisite introductory material is presented clearly and concisely (83 pages) in the first four chapters, with the bulk of the text (837 pages) dedicated to keys and detailed descriptions of taxa. The first chapter, Introduction, provides the reader a general overview of the Cruciferae, including short discussions of geographic diversity of the family worldwide, general morphological features of the family, notable deviations from the morphological norm, and economic importance. In addition, a synopsis is provided for the directions Rollins' own research has taken over the years. Interestingly, Rollins downplays speculation on evolutionary trends and higher-level relationships within the family. Chapter Two, Phytogeography and Endemism, focuses on the phytogeographic patterns manifest in the North American taxa. The various patterns of endemism, distribution, and centers of species diversity are discussed citing numerous specific examples. Chapter Three, Taxonomic Criteria, provides an invaluable overview of the range of variation, taxonomic utility, and limitations of the principal morphological characters utilized in the description and discrimination of crucifer taxa. Discussion is also provided for pertinent cytological and breeding system characteristics of taxonomic significance. These points are amply illustrated by excellent line drawings, photographs of living and pressed plants, and photomicrographs from SEM and traditional light microscopy. Chapter Four, Methods of Treatment, provides the author's rationale for kind and style of information provided in the species treatments, intensity of coverage of native vs alien taxa, format for presentation of distributional information, etc.

The remainder of the text is largely devoted to keys and detailed descriptions of the component taxa. Those keys I have used to identify field-collected specimens proved well written and logical, providing several characters for comparison at most couplets. Following a generalized description of the family and keys to genera, the genera are arranged alphabetically. A general description is provided for each genus, including nomenclatural citation, followed by keys and detailed descriptions of the included taxa, the latter arranged alphabetically when greater than one. Species descriptions, also including nomenclatural citations, are well written, providing ample details of all portions of the plant, but emphasizing those features considered diagnostic. This is followed by general information on flowering period, habitat, range, synonyms, and in many cases, other noteworthy information about the taxa. Line drawings of selected representative taxa are provided for most genera.

An appendix provides a list of new names published in the text. These include 7 new species, one new subspecies, 11 new varieties, and 16 new combinations. The literature cited section, which is exclusive of the nomenclatural citations, runs 10 pages and is a treasure-trove for those seeking additional information on the mustards.

It is difficult to find much fault with this book. Although a number of typographical errors were noted, these are but minor distractions. I found none that seemed to alter the intended meaning of the text, or introduce confusion into the keys or technical descriptions. Perhaps my greatest complaint might be the seemingly arbitrary exclusion of Greenland and the Caribbean islands from coverage. Surely inclusion of these regions would not have added substantially to the complexity of the text, and would have rounded out coverage for an otherwise broadly circumscribed "North America". Nevertheless, Rollins' work is an outstanding piece of taxonomic literature, worthy of a place on the reference shelf of any serious botanist.

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*Remarkable Agaves and Cacti*. By PARK S. NOBEL. 1994. Oxford University Press, New York and Oxford. 166 pp. Hardcover and Paperback, \$45, \$22. ISBN 0-19-508414-4, 0-19-508415-2 (pbk).

This "remarkable" book examines three aspects of agaves and cacti. The first part (Chapters 1–3) is a review of past and current uses of these desert and not-so-desert denizens. Agaves provide food, steroids, fodder, ornament, but most importantly beverages and fiber. Already, agaves produce 6% of the world's supply of precursors for corticosteroids. Certain cacti offer fruits and stems used as food, fodder, ornament, hallucinogens and carmine dye. Tells how Sicilians are able to produce larger and sweeter tuna fruits of prickly-pears. The red dye carmine, produced by cochineal scale insects farmed on prickly-pears, is a multi-use stain for arts, clothing, food, and cosmetics. In the 18th century, the value of cochineal dye exported from Mexico was second only to silver. Cheap aniline dyes largely replaced carmine, yet in 1992, 300 tons were produced, mostly in Peru; 80,000 to 130,000 female scale insects are needed to produce one kilogram of dyestuff.

The second part (Chapters 4–7) is a somewhat detailed discussion of the adaptive physiology of agaves and cacti. Explains water, CO<sub>2</sub> and mineral uptake, storage, and minimization of water loss by agaves and cacti. Answers such questions as: Why do roots grow better under or near rocks? How do mycorrhizae enhance growth? How is water stored? Why are prickly-pear pads oriented in certain patterns? How do these plants endure very high and low temperatures? Why do stomates open at night and close during the day? Which is the most efficient photosynthetic pathway—C<sub>3</sub>, C<sub>4</sub> or CAM metabolism? How does spacing of plants affect productivity?

The third part (Chapters 7–8) alerts us to the great, useful biomass production potential of certain species of agaves and cacti, more so than nearly any other vascular plant group. The author predicts a bright future for agaves and cacti. The understanding of morphology and physiology should result in new technology that will enhance production and increase profit from farming cacti and agaves.

The author amazingly weaves his tale utilizing a couple handful of species of two diverse groups of plants, monocots and dicots. His engineering background shows through his presentation of form and physiology. This book should intrigue the grower who likes to experiment, the student who wishes to learn basic biology in a challenging way, and the visitor to arid lands to become aware of the invisible activities occurring in the common desert agaves and cacti. The advanced student can learn from Dr. Nobel's many other books and journal articles on these subjects.

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